ORDA Long Pulse Operation

ORDA Systems Engineering

ABSTRACT

Addition of the Digital Receiver and use of SIGMET architecture mean changes to the way Long Pulse operates with ORDA. The legacy receiver has an analog matched bandpass filter optimized for short pulse. In ORDA this is replaced with a higher performing digital filter optimized for each pulse. For legacy processing, Long Pulse is combined to 750m and then match filtered to 500m. This operation isn't possible with the SIGMET architecture. ORDA will provide long pulse data at 500m.

Matched Bandpass Filter

ORDA makes significant changes to signal paths and signal processing in the WSR-88D. Most of the development effort has been centered on short pulse, but we're aware long pulse exists also. The legacy receiver system was optimized for short pulse; using a digital receiver enables us to correct this.

The analog bandpass matched filter in legacy is incapable of change; it's set for a 3dB bandpass of 630kHz. This is good for short pulse, but not for long pulse. In ORDA, we digitize at IF frequencies, and then use a digital filter for matched filtering. The digital filter is optimized for both short pulse and long pulse, giving us better sensitivity in long pulse, and a lower filter loss in both pulses. The analog bandpass matched filter gave a filter loss of approximately 1.5dB in short pulse, and wasn't matched well to the long pulse at all (a very low loss, but letting more noise through than necessary). The digital filter has a loss of approximately 0.5dB in short pulse and long pulse. This gives us better receiver response in both short and long pulse.

Long Pulse Processing

In the WSR-88D, long pulse is a 4.5µsec pulse, corresponding to 750m resolution. This resolution is inconvenient for processing, since the RPG expects Reflectivity spacing to be 1000m, and V/W spacing to be 250m.

In legacy operation, all data is gathered at 250m spacing (1.67µsec sampling). For long pulse operation, clutter filtering is done, and then the data is combined to 750m spacing. Next, Power Sums, Pulse Pair Accumulations, and Point Clutter filtering are done on the 750m spacing, and then the data is match filtered to 500m. For reflectivity, each pair of 500m bins is combined to 1km spacing. For velocity and spectrum width, each 500m bin is duplicated to appear as 250m spacing to the RPG. See Figure 1, Legacy Long Pulse Processing

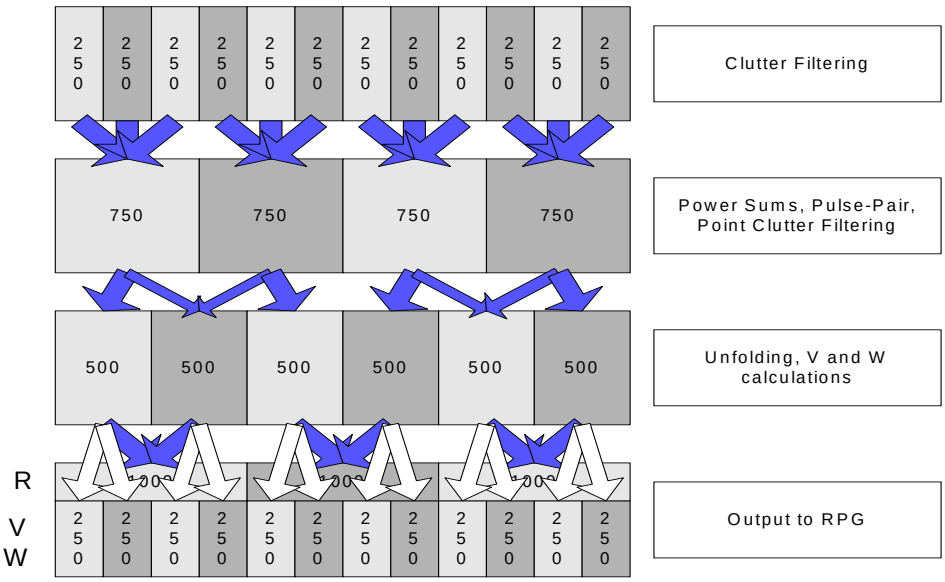

Figure 1, Legacy Long Pulse Processing

In ORDA, this processing isn't possible with the SIGMET architecture. To provide the closest equivalent to legacy, we will select 500m spacing for samples in long pulse, and the RVP8 will output 500m resolution R, V, and W. The DSPC process in the CPCI-01 software will convert R to echo power and combine to 1km spacing, and will duplicate V and W to provide 250m spacing.